B. Tech. – VIEP – MECHANICAL ENGINEERING (BTMEVI)

Term-End Examination

00973 **June, 2018**

BIME-015 : REFRIGERATION AND AIR CONDITIONING

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks. Use of Steam table, Refrigeration charts, Mollier diagram, Psychrometric chart and Scientific calculator is permitted.*

1. Define the COP of a refrigerator. Show that the COP of a heat pump is greater than the COP of a refrigerator by unity. *10*

2. List the factors which should be taken into consideration while selecting a system of air-conditioning. *10*

3. What are the effects of CFCs on the environment ? How do they affect the Ozone layer ? *10*

4. Explain the absorption refrigeration cycle. How does it differ from a vapour compression cycle ? *10*

5. Determine the ideal COP of an absorption refrigerating system in which the heating, cooling and refrigeration take place at 197°C, 17° and – 3°C respectively. *10*

6. An air-water vapour mixture enters an adiabatic saturator at 30°C and leaves at 20°C, which is the adiabatic saturation temperature. The pressure remains constant at 100 kPa. Determine the relative humidity and the humidity ratio of the inlet mixture. *10*

7. What is specific humidity ? When does it become maximum ? What is degree of saturation ? What are its limiting values ? *10*

8. A refrigerating system operates on the reversed Carnot cycle. The higher temperature of the refrigerant in the system is 35°C and the lower temperature is – 15°C. The capacity is to be 12 tonnes. Neglect all losses. *10*

   Determine :

   (a) Co-efficient of performance

   (b) Heat rejected from the system per hour

   (c) Power required

9. In a standard vapour compression refrigeration cycle, operating between an evaporator temperature of $-10°C$ and a condenser temperature of $40°C$, the enthalpy of the refrigerant, Freon-12, at the end of compression is 220 kJ/kg. Show the cycle diagram on T-s plane. Calculate

(a) The COP of the cycle

(b) The refrigerating capacity and the compressor power assuming a refrigerant flow rate of 1 kg/min.

You may use the extract of Freon-12 property table given below : *10*

t (°C)	p (MPa)	h_f (kJ/kg)	h_g (kJ/kg)
– 10	0·2191	26·85	183·1
40	0·9607	74·53	203·1

10. Define load on an air-conditioner. What are the two main types of loads ? Give examples. Discuss the cooling load on a theatre. *10*